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# **Airborne Meteorological and Turbulence Instrumentation**

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## **LONG-TERM GOALS**

The long-terms goals of the research are to understand and parameterize the physics of air–sea interaction and the marine boundary layer through experiments. A Defense University Research Instrumentation Proposal (DURIP) was funded to provide specialized meteorological and turbulence instrumentation for the Navy CIRPAS Twin Otter research aircraft to be used in the ONR Sea of Japan/East Sea experiment in Winter 2000.

## **OBJECTIVES**

The objectives are to acquire high-quality instrumentation for the 3-dimensional wind vector, temperature, humidity, pressure, sea-surface temperature and other variables for the CIRPAS Twin Otter research aircraft. The main focus is on instruments for turbulence which will allow the calculation of the eddy-covariance fluxes of horizontal momentum of the wind (stress), sensible heat and water vapor (latent heat) at altitudes as low as 30m above the ocean surface. A modern GPS/inertial measurement unit is used to measure the aircraft's motion and attitude angles, required for the calculation of earth-based winds.

## **APPROACH**

The approach, with consultation of Dr. Haf Jonsson of CIRPAS, was to develop the 5—hole radome pressure port system for the measurement of the mean and fluctuating airspeed vector (magnitude and attack and slip angles) to 20Hz. Aircraft motion will be measured to 10Hz with the GPS/inertial measurement unit. Fast-response redundant temperature sensors and Lyman-alpha and Krypton humidity sensors will be used for the sensible and latent heat flux measurements. All data will be integrated into a computer-based data acquisition system at 40Hz sample rate.

## **WORK COMPLETED**

To date, most of the equipment has been selected, ordered and received. Some of the equipment flew on a CIRPAS stratus cloud/drizzle project of the UNSPGS and University of Miami in summer 1999 in Monterey, CA.

## **RESULTS**

There are no results from the integrated aircraft system to date, as installation is still underway. A picture of the radome pressure-port system is shown in Figure 1.



*Figure 1: CIRPAS Twin Otter 5-hole pressure port system and sensors for temperature and humidity behind radome mounting ring.*

## **IMPACT/APPLICATIONS**

The application of the DURIP funds is to instrument the CIRPAS Twin Otter aircraft for turbulence and accurate mean meteorological measurements. It will add significantly to the suite of instruments and measurement capability of the aircraft for both the Sea of Japan/East Sea and future experiments.

## **TRANSITIONS**

Some of the instruments were used in the summer 1999 stratus/drizzle experiment of the USNPGS (Professor Q. Wang) and the University of Miami (Professor B. Albrecht).

## **RELATED PROJECTS**

The aircraft, instrumented for turbulence and meteorological measurements, will be used in the winter 2000 ONR Sea of Japan/East Sea experiment.